Final Technical Report

Award Number:	DE-FC36-02GO12073
Project Title:	Industrial Assessment Center Program
Project Period:	9/1/2002 to 11/30/2006
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Executive Summary

In the fiscal years 2003 through 2006, the LMU-IAC conducted 76 industrial assessments with 595 assessment recommendations, with 382 recommendations implemented, with practically all plant types and sizes, extending in geographical location from 250 miles north of LMU-IAC to 50 miles south and 90 miles east. Plant sizes varied from one building of 30,000 sq ft to 17 buildings of 1.5 million sq ft. The amount of energy savings identified was worth about $34,303,699. Because of the national level Lean Programs at the university, LMU-IAC is unique in its expertise of the impact of Lean productivity on energy savings, which is huge, far exceeding the energy savings from the equipment improvements. Besides energy savings, LMU-IAC promoted the good name of the program and DOE in the local industry, utilities, trade organizations, the vast aerospace industry, educational institutions, and the public. The IAC work resulted in numerous public lectures, a chapter in the Encyclopedia of Industrial Energy, several journal articles. 37 students, including 8 graduate students have been trained and issued DOE IAC Certificates. Several of them found work as energy experts.

Task Summary

Task 1: Conduct Industrial Assessments, to include a variety of plant types and sizes as well as coverage of the geographic area defined in the Annual Workplan Industrial Assessments.

In the fiscal years 2003 through 2006, the LMU-IAC conducted 76 industrial assessments with 595 assessment recommendations, with 382 recommendations implemented. Types of plants included the following:

- casting: die-, sand-, investment-, and centrifugal-
- forging: axles, seamless rolled rings
- machining: thread rolling, fasteners, gears
- heat treating: steel, bronze, aluminum
- polymers: injection molding, plastic film, rubber, glass
- electronics: printed wire boards, components
- floriculture (potted plants)
- food: cookies, crackers, sauces, juices, pies, margarine, cheese
- paper: boxes, tissue, kraft, envelopes, printing
- textiles: weaving, printing/dying
- one huge aerospace company campus (plant assigned under the LEU program)

Most of the plants assessed were in Los Angeles County, with a few in Kern County, Santa Barbara County, and San Bernardino County. The largest geographical distance between the plants served is about 250 miles. Plant sizes varied from one building of 30,000 sq ft to 17 buildings of 1.5 million sq ft.

Task 2: Promote and increase the adoption of assessment recommendations and employ innovative methods to assist in accomplishing these goals.

Activities undertaken in this category include the following:

- Both the Director and Assistant Director attended almost all assessments, increasing the interest of the clients in both energy and productivity.
- Selected reports were delivered to the clients in person, sometimes including an in-person PowerPoint presentation.
- The reports focused on recommendations with low implementation costs and fast payback periods.
- The report format and AR formats were changed several times to make them more user-friendly.
- ARs with poor implementation rates were discontinued. At the exit interview, if a client showed little interest in a recommendation, it was dropped.
- Reports were sent to CEOs and CFOs, who would have an interest in saving money.
- The internal implementation form was redesigned to include more detail and was sent to the client before the implementation interview.
- A serious effort was made to shorten the time between the assessment visit and delivery of the report. Our reports were almost never late, and most produced with time to spare.
- After some time, it was decided to send the 12-month follow-up implementation report to all clients, rather than only selected ones.

- A special effort was made to link productivity to energy, producing major energy savings.

Task 3: Promote the IAC Program and enhance recruitment efforts for new clients and expanded geographic coverage.

The LMU-IAC was promoted through the following very supportive organizations:

- Southern California Edison
- Southern California Gas Company
- Several large aerospace companies
- The LMU alumni network

The IAC Director gives a presentation most years at President's Day, when friends and alumni return to the university for a day of lectures and celebration.

Diligent care with our reports and client contacts resulted in a good reputation that preceded our recruiting efforts. The IAC brochure and Best Practices Tools CD were distributed liberally to potential clients.

We made numerous (several per year) slide shows at various meetings, including the meetings of the North American Die Casting Association Chapter 30 and California Manufacturing Technology Consulting, an IEEE conference for industrial engineers at the University of Southern California, and a one-day workshop at LMU for the Alliance to Save Energy were fruitful.

Some assessments were performed in nearby Orange County, Ventura County, and San Bernardino County. In conjunction with the Save Energy Now (SEN) Program, a few assessments were performed in Kings County and Tulare County, in the Central Valley of California.

Task 4: Provide educational opportunities, training, and other related activities for IAC students.

Regular Tuesday meetings during the school year were devoted to lectures on calculation techniques for energy assessment recommendations; current energy issues of local, state an national interest; industrial processes of the type seen on the assessments; and lean productivity recommendations and their huge impact on energy savings. During the fiscal years 2003 through 2006, 37 students participated in the LMU-IAC. Almost every semester the program supported 2 graduate students and 6-20 undergraduate students through the use of novel management techniques.

Task 5: Coordinate and integrate Center activities with other Center and IAC Program activities, DOE's Industrial Technologies programs and other EERE programs.

The LMU-IAC Director is a member of the MIT-based Lean Aerospace Initiative and taught the Lean method at several local aerospace companies. He promotes energy savings from lean productivity in these venues.

LMU-IAC personnel had regular conversations with the IAC faculty and lead students at San Diego State University and San Francisco State University. Companies in Orange County that inquired about assessments were referred to the SDSU-IAC.

The LMU-IAC was active in trying to save the IAC Program. The President of the University, the Dean of the College of Science and Engineering, the IAC Director and Assistant Director, several other faculty, and most IAC students wrote letters to their congress persons.

The LMU-IAC was active in the Save Energy Now Program, including telephone conversations, workshop preparation, promotions, and additions to the report format.

Task 6: Other tasks or special projects, as needed, and as determined by DOE to be advantageous to the program and in furtherance of IAC Program goals.

- The pay to student was increased to encourage them to finish reports in a timely way.
- We developed over a hundred new AR types.
- The Assistant director became a Qualified AirMaster+ Specialist and a Qualified PHAST Specialist.
- The LMU-IAC performed a Case Study for Client #85 and presented it at the Director's Meeting. The client became more profitable as a result.
- The Assistant Director became a Certified Energy Manager.
- The Director wrote several papers on the Lean Method and the Impact of Lean on Energy Savings and presented the method at several conferences and published them in the Encyclopedia of Industrial Energy and the Strategic Energy Journal.
- The Director organized several seminars for industry.
- The Assistant Director attended several one-day workshops and classes at Southern California Edison and the Southern California Gas Company.
- The University provided assistantships for two graduate students every semester.
- In conjunction with the Save Energy Now Program, the LMU-IAC presented a workshop at LMU with speakers from the Southern California Gas Company and Southern California Edison, as well as the Director and Assistant Director.